Environmental Benchmarking for Freight Transportation Air Emissions

Talking Freight Webinar

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April 16, 2014
We’re going to discuss:

- What is environmental benchmarking?
- Business case for benchmarking
- Benchmarking process
- Types of benchmarking metrics
- Major industry benchmarking initiatives
- Case studies
Project background

- Funded by National Cooperative Freight Research Program
- Focus on freight transportation and air emissions
- Discuss benchmarking from the perspective of carriers (truck, rail, air, marine), facility operators (ports, airports) and shippers
- Examine benchmarking at different levels (fleet, facility, organization, supply chain)
What is environmental benchmarking?
What is benchmarking?

- Business tool for improving performance
  
  - “Benchmarking is the continuous process of measuring products, services and practices against the toughest competitors or those recognized as industry leaders” - David Kearns

  - “Benchmarking is the search for industry best practices that lead to superior performance” - Robert Camp

| Identify Process To Benchmark | Measure Performance | Compare to Industry Leaders | Identify Gaps | Action Plan | Measure Results |
What is benchmarking? (continued)

- Outward looking
- Search for best practices appropriate for your business
- Can involve comparisons within your industry or look outside your industry
- Focused on the most important parts of your business
- Data driven
- Action oriented - built on detailed understanding of achievable performance in different markets
What kind of environmental impacts?

- Direct and indirect air emissions impacts
- World Resources Institute and the World Business Council for Sustainable Development GHG protocol defines three emissions scopes
  - Scope 1 direct emissions from equipment and vehicles owned by the company
  - Scope 2 emissions associated with purchased electricity
  - Scope 3 emissions are indirect emissions that are a consequence of a company’s actions, but are not controlled by them (purchasing transportation, employee commuting)
What kind of air pollutants?

- Criteria air pollutants
  - NOx, PM, SOx, etc.
- Greenhouse gases (GHG)
  - CO2, CH4,N2O, HFCs
- Air toxics
  - Diesel particulate matter

GHGs from Transportation

- All Other Transportation Sources
- Ships and Boats 2%
### What entity types and scales of analysis?

<table>
<thead>
<tr>
<th>Entity Types</th>
<th>Scales of Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fleet</td>
</tr>
<tr>
<td>Truck Carrier</td>
<td></td>
</tr>
<tr>
<td>Rail Carrier</td>
<td></td>
</tr>
<tr>
<td>Marine Carrier</td>
<td></td>
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<tr>
<td>Air Carrier</td>
<td></td>
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<tr>
<td>Marine Port</td>
<td></td>
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<tr>
<td>Airport</td>
<td></td>
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<tr>
<td>Shipper &amp; Receiver</td>
<td></td>
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</tbody>
</table>
Business Benefits of Environmental Benchmarking
Business benefits of environmental benchmarking

- Improved information for management
- Reduced costs
- Competitive advantage
- Reduced risk
Business benefits of environmental benchmarking (continued)

- Demonstrating environmental stewardship can raise the standing of the company with stakeholders
  - Customers
  - Local community
  - Potential and current employees
  - Regulators and licensing agencies
  - Investors
Benchmarking Process
Detailed process overview

**Planning**
- Identify function to benchmark
- Identify best-in-class organizations
- Select performance measures
- Identify data collection methods

**Analysis**
- Collect data internally & externally
- Measure and compare organizations performance
- Identify best practices to close the gap

**Integration**
- Communicate findings and obtain buy-in
- Develop action plan

**Action**
- Implement actions and monitor progress

**Maturity**
- Close performance gap
- Integrate practices into processes
Planning

- Identify function to benchmark
  - Define important function, break into steps

- Identify best-in-class organizations in that function
  - Type of partner (internal, competitive, industry, functional, generic)

- Select performance measures
  - How do measures link to organizational goals or the measures used by other organizations?

- Identify data collection methods
  - Existing data review, surveys, interviews, focus groups, site visits
Analysis

- Collect data internally and externally
  - Structured process to understand differences

- Measure and compare organizations’ performance
  - Focus on both positive and negative gaps
  - Understand the enablers

- Identify best practices to close gap
  - Vehicle, operational, infrastructure
Analysis: Fishbone chart of fuel economy enablers

Source: Kenworth white paper
Types of Environmental Benchmarking Metrics
Types of environmental performance evaluation

- Management performance indicators
- Operational performance indicators
- Environmental condition indicators

Types of quantitative indicators
- Absolute (tons of CO2)
- Relative or normalized (gallons of fuel per ton-mile)
- Indexed (percent change in CO2 emissions from 2008)
- Aggregated (CO2 emissions from all transportation activities)
- Weighted (Walmart’s proposed sustainability index)
### Sample truck carrier performance measures

<table>
<thead>
<tr>
<th>Functional Unit</th>
<th>Environmental Performance Metric</th>
<th>Level of Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Organization</td>
</tr>
<tr>
<td>Total Miles</td>
<td>Average emissions (CO₂, NOₓ, PM) per mile</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Average MPG</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>% empty miles</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Average customer density per route</td>
<td>✓</td>
</tr>
<tr>
<td>Revenue Miles</td>
<td>Average emissions per revenue mile</td>
<td>✓</td>
</tr>
<tr>
<td>Ton-Miles</td>
<td>Average emissions per ton-mile</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Average gallons of fuel consumed per ton-mile</td>
<td>✓</td>
</tr>
<tr>
<td>Revenue</td>
<td>Average emissions per unit of transportation revenue</td>
<td>✓</td>
</tr>
<tr>
<td>Volume of goods moved</td>
<td>Emissions per cubic foot-miles</td>
<td>✓</td>
</tr>
</tbody>
</table>
## Sample truck carrier performance measures (continued)

<table>
<thead>
<tr>
<th>Functional Unit</th>
<th>Environmental Performance Metric</th>
<th>Level of Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Truck/trailer Improvements</strong></td>
<td>% trucks with transmission and drivetrain improvements</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>% trucks with engine improvements</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>% trucks with aerodynamic improvements</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>% trucks with rolling resistance improvements</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Engine Operating Hours</strong></td>
<td>Idling hours as a % of total engine-on hours</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Truck Terminal</strong></td>
<td>Total annual emissions from truck terminal per average number of trucks serviced at the terminal</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>LEED certification score</td>
<td></td>
</tr>
<tr>
<td><strong>Year of Company Operation</strong></td>
<td>SmartWay Score</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Year of Company Operation</strong></td>
<td>DOW Jones Sustainability Index</td>
<td>✓</td>
</tr>
</tbody>
</table>
Major Benchmarking Initiatives
Examples of industry benchmarking programs

- **EPA SmartWay Transport Partnership**
  - Flagship program for improving fuel efficiency and reducing greenhouse gases and air pollution from the freight sector
  - Over 3,000 participants, including most of the largest truck carriers, all Class 1 railroads, shippers and many logistics companies
  - Program assesses emissions (CO2, NOx, PM10, PM2.5) of carrier fleets and benchmarks them against peers
  - Primary metrics are grams of emissions per mile and grams per ton-mile
  - Truck fleets are ranked in 1 of 5 performance “bins” for CO2, NOx, PM
  - EPA working to add other freight modes to program
### Truck carriers
- Truckload dry van
- Less-than-truckload dry van
- Package Delivery
- Moving
- Expedited
- Drayage
- Tanker
- Flatbed
- Refrigerated
- Auto Carrier
- Heavy/Bulk
- Specialized
- Mixed (no predominant operation or equipment type)

### Logistics companies
- Multimodal carriers (truck and rail intermodal operations)
Examples of industry benchmarking programs (continued)

- **Clean Cargo Working Group**
  - Partnership of containership operators and shippers

- **Green Marine Program**
  - Initially for the Great Lakes and St. Lawrence corridor
  - Covers SOx, NOx and GHGs, invasive species, noise, water quality

- **Carbon Disclosure Project**
  - Voluntary CO2 emissions reporting
  - Ability to benchmark against peer groups
  - Showcase successful mitigation strategies
Examples of industry benchmarking programs (continued)

- Truckload Carriers Association benchmarking program
  - Carriers are segmented into carrier specialty groups
  - Monthly statistics, in-person meetings – includes fuel economy

- Dow Jones Sustainability Index
  - Global and regional benchmarks
  - Includes climate change mitigation and supply chain standards

- Supply Chain Consortium
  - Supply chain efficiency benchmarking
Among truck carriers, participation in SmartWay was the most common form of environmental benchmarking.

Multiple environmental benchmarking efforts in the marine sector (e.g., Clean Cargo Working Group, Green Marine, Clean Shipping Index, IMO indices).

Many carriers do not currently conduct environmental benchmarking, even for fuel economy.

Making meaningful comparisons among different carriers is perceived as a major challenge.
Case Studies
Con-way fuel benchmarking program

- Truck computers provide detailed data
  - Fuel used and where purchased
  - Gross weight of truck for each movement
  - Origin and destination for each movement, including empty moves
  - Vehicle miles of travel
  - Driver behavior—shifting, braking, acceleration, speed, idling, etc.
  - Characteristics of tractor—make, age, transmission, etc.
  - Characteristics of trailer make, age, any special features
Con-way fuel benchmarking program (continued)

- Comparative industry fuel economy data
  - Salesmen for original equipment manufacturers
  - Industry groups such as the Technology and Maintenance Council
  - Private carriers
  - SmartWay
Con-way fuel efficiency measures

- Direct fuel efficiency measures
  - Correction of fuel-wasting practices of drivers
  - Types of equipment acquired – side skirts & under trays
  - Maintenance practices

- Measures with broader corporate goals:
  - Design of LTL network – saved 20,000 gallons fuel per day
  - Dispatch software
  - Marketing strategy—in which lanes to build density
  - Equipment life
Stonyfield Farms

- Benchmarking customer emissions
  - Uses data from 3PL Ryder to track performance
  - Metrics include – metric tons of CO2/metric ton product delivered & CO2 emissions/customer
  - Provides comparative information to customers
  - Shifted LTL routes to multi-stop TL routes – 40% VMT reduction
Canadian National Railway

- Participates in Carbon Disclosure Project

- Metrics:
  - CO2-e per gross ton-mile for rail
  - Gross ton mile per gallon of fuel consumed – all modes

- Geographical comparison of routes
Leading energy company

- Logistics Center of Excellence
  - Benchmarked mitigation strategies and CO2 inventory program
  - Developed scope 3 emissions inventory & mode shift program
  - Wind turbine supply chain optimization – 1000 ton CO2 emission reduction & 5 million cost savings
Contact Information

- NCFRP Report 21, *Handbook on Applying Environmental Benchmarking in Freight Transportation* available at the web link below:
  

- For more information or a hard copy, feel free to contact me

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